

501 ✓

TAXONOMY OF THE
KARROO AND
RED-BACK LARKS
OF WESTERN
SOUTH AFRICA

J. D. MACDONALD

U. of ILL. LIBRARY
NOV 8 1972
CHICAGO CIRCLE

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ZOOLOGY
Vol. I No. II
LONDON: 1953

TAXONOMY OF THE KARROO AND
RED-BACK LARKS OF
WESTERN SOUTH AFRICA

BY

J. D. MACDONALD

Pp. 319-350; Pls. 36-38; 5 Text-figures

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ZOOLOGY
LONDON : 1953

Vol. I No. II

THE BULLETIN OF THE BRITISH MUSEUM
(NATURAL HISTORY), *instituted in 1949, is issued
in five series, corresponding to the Departments of the
Museum.*

*Parts appear at irregular intervals as they become
ready. Volumes will contain about three or four hundred
pages, and will not necessarily be completed within one
calendar year.*

This paper is Vol. I, No. II of the Zoological series.

PRINTED BY ORDER OF THE TRUSTEES OF
THE BRITISH MUSEUM

Price Revised

Issued January 1953

Price Ten Shillings

TAXONOMY OF THE KARROO AND RED-BACK LARKS OF WESTERN SOUTH AFRICA

By J. D. MACDONALD

[Received 1st September 1951]

INTRODUCTION	321
HISTORICAL NOTE	321
METHODS	323
MATERIALS AND ACKNOWLEDGEMENTS	323
POPULATIONS EXAMINED:	
Cape Flats	324
Berg River and Saldanha Bay	325
Lambert's Bay	325
Swellendam and Deelfontein	326
Traka and Nels Poort	326
Namaqua-Bushman-land Region	327
Orange River Mouth	329
Witputs Area	330
Aus Area	331
Namib Dunes	333
DISCUSSION	
Dimensions: Colour and Pattern: Developmental Stages: Breeding-cycle: Habits: Nomenclature	335
SUMMARY	345
REFERENCES	345
TABLES OF MEASUREMENTS	346

SYNOPSIS

A review of the Karroo and Red-back Larks in the light of recent data indicates that these two birds, long regarded as separate species, and sometimes placed in different genera, are in fact geographical races of the same species. Variation is limited almost entirely to colour and pattern, and there is a gradual transition from one extreme form to another. Seven geographical races are recognized, two of which are new.

INTRODUCTION

MATERIAL and data collected by the British Museum (Natural History) South West Africa Expedition (1949-1950) throw new light on the taxonomy of the Karroo and Red-back Larks, usually assigned to the genera *Calendulauda* and *Pseudammodramus*. Birds of two different colours, apparently identical in every other respect, were found in each other's company near the mouth of the Orange River. The 'grey' birds were thought to be *Calendulauda albescens* and the 'red' birds *Pseudammodramus* (?species). It now seems that these birds belong to two groups which may be more closely related than has been recognized hitherto. The purpose of this paper is to examine this matter in the light of the data now available.

HISTORICAL NOTE

The published history of these larks begins with the description of the Karroo Lark by Lafresnaye¹ (1839:259). He described two species, first *Alauda albescens*

¹ The name *Certhilauda nivosa* Swainson, 1837, though often used for the Karroo Lark, was shown by Roberts (1936a: 257) to be inapplicable, being based on a juvenile *Galerida cristata senegalensis*.

from Blauw-Berg (Blaauwberg Beach, in the north of Table Bay), a 'grey' bird, and then a 'red' species *A. guttata* from Elephant's River (now Oliphant's River), Cape Province. The types are in the Museum of Comparative Zoology, Cambridge, Mass., U.S.A.: that of *A. guttata* is said to be a bird in juvenile plumage. Unaware of Lafresnaye's description Andrew Smith (1843) also described 'grey' and 'red' birds as separate species, the former as *Alanda codea* and the latter as *A. lagepa*, both of which were figured together on Plate 87. Specimens of each of his species are represented in the National Collection, but they can only be regarded as co-types, for Smith did not designate types and his collection was split up.

An analysis of Smith's descriptions shows that in dimensions, distribution, and habits these two species are very similar. Sharpe (1874: 624) came to the conclusion 'that they are nothing but the summer and winter plumage of the same bird. However curious this may seem, I think it is not to be refuted on the evidence of the specimens which I have before me'.

Sharpe's opinion held until Roberts (1936a: 258; 1940: 191) revived the conception of two sympatric species differing mainly in colour and divisible into several geographical races. In the pallid or grey form, *Calendulauda albescens*, he recognized three races, the typical one, a second race *C. a. saldanhae*, with a strong tinge of rufous on the upper parts, but not so rufous as *C. guttata*, and a third *C. a. karruensis*, very dark above with some rufous in parts. In the rufous form, *C. guttata*, he recognized two races, *C. g. calviniensis* being slightly larger than the typical form.

Meinertzhagen¹ (1951: 107) put all these variations into one polymorphic species, *C. albescens*, in which variation could not be correlated with distribution. He calls it 'a very variable bird in both size and colour throughout its range. It has a pure grey and a pure red phase, with every intermediate and without constancy in distribution'.

The first Red-back Larks were found by Andersson in the dry sandy bed of the Kuiseb River, near Walvis Bay. Strickland (1852) named them *Alanda erythrochlamys*. Several birds found in other localities, notably in the Transvaal by Ayres (1874), were wrongly associated with this species, but remained with it until removed by Roberts. In fact the true Red-back Lark does not seem to have been recorded² again until Roberts (1937: 95) found it about 30 miles north of Aus, a place about 60 miles inland from Luderitz Bay and about 300 miles south of Walvis Bay. Roberts also found specimens nearer Aus, but concluded that they belonged to a different species, which he named *Pseudammomanes barlowi*.

Hoesch and Niethammer (1940: 224) did not agree with Roberts and maintained that the Aus birds were inseparable from those at Walvis Bay. Neither did Meinertzhagen (1951: 107), but he put the species into the genus *Certhilauda* along with the Karroo Lark and several other species.

¹ I am indebted to Colonel R. Meinertzhagen for his courtesy in lending me a typescript copy of his paper which was in course of publication when this paper was in preparation.

² R. D. Bradfield collected a specimen on the Kuiseb River on the 18th of December 1928, but it does not seem to have been recorded. It is in the Transvaal Museum.

METHODS

The morphological characters examined here are lengths of wing, tail, bill, and first primary; also colour and colour-pattern. Other characters considered are moults, breeding-cycle, developmental stages, and habits.

Wing measurements are taken on the stretched wing; tail measurements from the crotch of the two central tail feathers, into which the leg of a divider can be firmly pressed, to the tip of the longest feather; bills are measured from the cranio-facial angle to the tip; and first primary from the hard sheath covering the base of the shaft. The degree of error due to the set of the wing, the variation in the method of stretching, and the age of the critical feathers, whether fresh or not quite fully grown, or in various stages of wear, made it impossible to attempt extremely accurate measurements. The purpose of the measurements is merely to discover general correlations and they are taken to the nearest millimetre.

For standards of colour Villalobos's *Colour Atlas* (1947) was used. This atlas contains a range of thirty-eight hues each of which is divided into a number of tones obtained by the combination of two variables, degree of lightness and degree of chromaticity. For example, in the symbol OOS/12/5 the OOS indicates the hue which is a mixture of two parts orange and one part scarlet; the figure 12 indicates the degree of lightness, the range 1-20 being from darkest to lightest; and the figure 5 the degree of chromaticity, the range 1-12 being from the least to the greatest intensity of colour. Even without the *Colour Atlas* these symbols can convey some meaning to the reader, at least in a comparative sense. For example, of the differently coloured larks of this group under examination from near the mouth of the Orange River the 'grey' birds match approximately OOS/9/4 and the 'red' birds OOS/8/5; the inference is that they belong to the same colour group, or hue, but that the 'grey' birds are one degree lighter and one degree less colourful than the 'red' birds.

The use of these symbols may be regarded as an experiment in this method of colour determination and colour comparison. The conclusions reached so far is that, though it is not ideal, it is unquestionably more satisfactory than the usual descriptive terminology, which often means one thing to the writer and something quite different to the reader. The *Colour Atlas* gives a cross-reference to colour names in common use, and where possible these have been included in the text. In birds with a streaked pattern the coloured area referred to in the following notes is that found outside the dark centres of the feathers (see Fig. 4).

MATERIALS AND ACKNOWLEDGEMENTS

This study is based on 80 specimens collected by the British Museum (Natural History) South West Africa Expedition (1949-1950), 36 other specimens in the National Collection, 45 in the Transvaal Museum, Pretoria, 13 in the South African Museum, Cape Town, and 21 in the private collection of Colonel R. Meinertzhagen.

For their kindness in giving me permission to examine specimens, and sending others to me for examination, I have to thank Dr. V. FitzSimons and Mrs. J. Campbell, of the Transvaal Museum; Dr. K. Barnard, of the South African Museum; and Colonel R. Meinertzhagen.

I am indebted to Mr. J. D. M. Keet, of the Department of Agriculture, Pretoria, for information on the *Aristida* grasses of the Namib. For obtaining permission to enter the diamond controlled area at Tsondab Mund to look for these larks I am indebted to Mr. A. D. Vos, Inspector of Mines, Windhoek; and to Colonel Mentz, of the South African Police, for providing us with a police escort.

Many of the specimens and data obtained by the Expedition were collected by two of my companions, Colonel F. O. Cave and Mrs. B. P. Hall. As a small tribute to their assistance, two new geographical races, based on material collected by the expedition, have been named after them.

POPULATIONS EXAMINED

In the first instance the evidence of specimens in various localities and areas will be examined: these places are located on the map, Plate 36. It is convenient to begin with the Cape area.

Cape Flats

Eleven specimens from localities in the Cape Flats have been examined. They are from Blaauwberg, on the coast about 10 miles north of Cape Town, the type locality of *Alauda albescens*; Milverton, a few miles north of Blaauwberg; Durbanville, about 10 miles out of Cape Town on the Wellington road; and Philadelphia, about 20 miles out on the Malmesbury road. There is also an old Butler specimen labelled 'Cape Town'. All these birds are similarly 'grey' in colour, actually a light drab, about OOS/11/3 in the *Colour Atlas*. Birds of this colour have not been recorded from localities outside the Cape Flats, other than 'grey' birds of a slightly different tone which occur along the coast (see notes on Berg River and Saldanha Bay specimens). But three Smith specimens which are identical and belong to his 'grey' *A. codea* require a special note, for Smith (1843) gives the range of this species as 'generally found upon the Karroo plains between the Oliphant and Orange Rivers'. Roberts (1936a: 312) shows that Smith had made entries in his early diaries on a lark found in the vicinity of Cape Town which, as Roberts points out, might easily have been this species. When he prepared his *Zoology* some years later, Smith must have had some difficulty in sorting out his data referable to birds he then described as the new species, *A. codea* and *A. guttata*, especially as these birds now appear to be polychromatic variations of the same species. It is my opinion, therefore, that Smith actually obtained the specimens on which he based his *A. codea* in the Cape area and not between the Oliphant's and Orange rivers.

One of Smith's specimens is just completing moult. It is undated, but may be the specimen referred to by Smith in his notes, see Roberts (1936b: 313), 'on the 4 December killed a young lark . . . on the ascent of the Lions Rump'.

According to A. W. Vincent (1946: 446) 'they begin to show breeding activity in early August'; he has seen young birds about in October, but also nests with eggs in November. He says that this lark 'appears to be confined to the lower shady ground to the northward along the coast and close to the shores, becoming common farther out and extending through the drier western districts'.

The dimensions of the fourteen specimens referred to are as follows:

<i>Sex</i>	<i>No.</i>	<i>Wing</i>	<i>Tail</i>	<i>Bill</i>	<i>F.P.</i>
♂	5	88-94	62-68	18-20	28-32
♀	4	82-88	56-61	18-20	28-33
?	5	85-90	60-64	17-19	27-33

The Cape Flats population, therefore, seem to have a distinctive light drab colour and the small range of measurement shows that females are slightly smaller than males. The main breeding-period appears to be about September to November, and the usual habitat is sandy scrub.

Berg River and Saldanha Bay

One Layard specimen from Berg River matches the Cape specimens perfectly in colour. Two other Layard specimens from the same locality have a slight pinkish-rufous wash on the upper parts, about OOS/10/3. All are undated and only one is sexed. Modern maps show Berg River as a locality about 70 miles north of Cape Town and about 15 miles from the mouth of the Great Berg River which opens into St. Helena Bay. On old maps the river itself is so named and there is therefore no certainty that the specimens were collected in exactly the same locality.

Roberts (1936a: 258) found rufous-coloured birds at Saldanha Bay, which is on the coast about 20 miles west of Berg River and 60 miles north of Cape Town. He described them as having 'a strong wash of rufous on all the upper parts, but not as rufous as in *Calendulauda guttata*'. Two specimens collected by Shortridge in 1903 at Hoetzes Bay, Saldanha Bay, which are in the South African Museum, fit this description and are exactly similar to our pinkish-rufous Berg River specimens. They are rather worn. One of Roberts's specimens, collected in November, is in juvenile plumage.

Measurements of Berg River and Saldanha Bay specimens are as follows:

<i>Sex</i>	<i>No.</i>	<i>Wing</i>	<i>Tail</i>	<i>Bill</i>	<i>F.P.</i>
♂	3	91	62-68	19-20	31-32
♀	1	88	61	20	27
?	2	90-93	64-66	20	28

There is, therefore, evidence suggesting that the Cape Flats population extends north to some locality on the Great Berg River and is there replaced by populations which are mainly pinkish-rufous, the latter not showing any appreciable dimensional difference nor difference in breeding-period.

Lambert's Bay

Three specimens, an adult and two juveniles, from Lambert's Bay, about 130 miles north of Cape Town, are in the Transvaal Museum. The adult is slightly more colourful, about OOS/10/4, than the Saldanha Bay birds, and similar specimens

collected by Roberts from near Port Nolloth, which he associated with his *C. a. saldanhae*: its dimensions are, wing 92, tail 71, bill 19. The juveniles taken in October are more richly coloured, about OOS/10/5, and compare with inland specimens from Klaver and Springbok areas. The material is too scanty on which to base any conclusions, but it seems that 'greyish' birds somewhat similar to those at Saldanha Bay do occur on the coast at this point, and may connect with similar populations which have been found farther north at Port Nolloth.

Swellendam and Deelfontein

Before going inland, across the mountains, to Klaver, Van Rhynsdorp, and north to the Springbok area, specimens from east and north-east of Cape Town may be examined.

A Layard specimen from Swellendam, which is about 150 miles due east of Cape Town and 30 miles inland, is snuff-brown, about OOS/6/5. It is in very fresh plumage, but is neither dated nor sexed: dimensions are, wing 83, tail 62, bill 18, first primary 30. A rather lighter tone of colour, about OOS/7/5, is found in two adult specimens from Deelfontein, which is about 280 miles to the north-east of Cape Town and about 25 miles from De Aar where Roberts (1936a: 258) located his *C. a. kurruensis*, which was described as 'a very dark race'. One juvenile from the same locality, with wings and tail half-grown, is rather richer in colour, about OOS/6/7, while a second juvenile is noticeably browner, about OOS/9/5, and in this respect is very like birds in juvenile plumage from the Springbok area. The two adults were in fresh post-breeding plumage when taken in late February, which fits in more or less to the same breeding-cycle of the juvenile of the same colour taken in early March. The browner juvenile was taken in late January, and from the worn condition of its plumage had been in this dress for about 2-3 months. Dimensions are:

Sex	No.	Wing	Tail	Bill	F.P.
♂	1	94	69	?	28
♀	1	84	62	16	26
Juv. ♂	1	92	66	15	29
Juv. ♀	1	?	?	?	?

Apart from one specimen which does not fit in colour, nor apparently in breeding-cycle, the Swellendam and Deelfontein specimens, in colour at least, are similar. They are distinctly different from those in the areas so far examined, but appear to be not unlike birds in the Springbok area.

Traka and Nels Poort

Traka and Nels Poort are about 60 miles north and south of each other, and about 250 miles east of Cape Town. Single Layard specimens from each of these localities are very similar in colour, but are rather duller brown than the Swellendam-Deelfontein specimens. In the Traka and Nels Poort birds the lighter outer area of the feathers is almost entirely replaced by the darker centre which is dark brown, about OOS/6/4. The thin margin of lighter colour is about OOS/9/5, and the juvenile

has almost pure white tips and margins. They are neither sexed nor dated. Dimensions are:

<i>Sex</i>	<i>No.</i>	<i>Wing</i>	<i>Tail</i>	<i>Bill</i>	<i>F.P.</i>
?	1	92	64	17	26 (Nels Poort)
?	1	91	68	?	34 (Traka)

Namaqua-Bushman-land Region

Specimens from Klaver, on the Oliphant's River, and van Rhynsdorp, east to Calvinia and Carnarvon, and north to Kamieskroon, Grootberg,¹ Springbok, and the majority of those obtained near Port Nolloth are very alike in general colour, and will be considered together. A series of 63 specimens, largely from the Springbok area, have been examined. On the whole they seem to be a shade lighter than the Swellenden and Deelfontein specimens, being about OOS/8/5 as against OOS/6/5; the outer margins of the feathers are lighter, almost whitish in fresh specimens—particularly on the wing converts—and the dark central streaks are rather narrower and less diffuse. Below, the general colour is whiter, lacking much of the creamy-buff wash, which is particularly evident on the breast.

A series of adults taken at different times of the year provides information on seasonal changes. Three males collected by Gill at Kamieskroon in September had enlarged gonads; they are very worn, and were almost certainly breeding. Specimens collected by us in the same locality in early December are just beginning post-breeding moult; others from Klipfontein later in the month are just completing moult. Moult apparently begins on forehead and throat and works backwards towards the tail. Wing coverts are moulted early, but wing and tail moult begins later and in the usual manner, namely, starting at the junction of primaries and secondaries in the wing and proceeding away from that position, and commencing with the central pair of tail feathers. Specimens sometimes are in very fresh body plumage when wings and tail are barely half moulted. New feathers on the upper parts have a pinkish 'bloom' and have a very pale, nearly white edge on wing coverts, scapulars, and inner secondaries. During the year feathers become very much abraded, the pinkish 'bloom' disappears, pale edges disappear, and inner secondaries and central tail feathers in particular become very much worn.

Young birds in juvenile plumage were more in evidence at Kamieskroon and Springbok early in December when adults were beginning to moult. None was found at Klipfontein later in the month when adults had nearly completed moult. (Young birds in this area were not specially sought.) The main feature of the juvenile plumage is that the dark centres of the feathers are much narrower, sometimes

¹ An Andersson locality. Wallis (1936: 285), in his biography of Andersson, notes that 'on July 2nd (1862) Andersson came to the ford of the Orange River (Sendelings Drift)'. After sending his wife and child ahead in the waggon 'he was able to rejoin them about the middle of July near the Buffalo River in Cape Colony'. He must therefore have been a good way south of Grootberg on the Orange River by the 29th July, the day on which the specimens were collected. The Buffalo River is presumably the one now named on maps as Buffel's River, which rises in the mountains south of Springbok. On some large-scale maps there is a locality marked Grootberg, about 13 miles south-west of Kamieskroon, and it is almost certain that this is the locality in which the specimens were collected.

almost completely absent on the body feathers of the back, but when present appear as black flecks rather than streaks. On the innermost secondaries the dark streaks are very little wider than the shaft, and in the central tail feathers it is only about half as wide as in adults. Whitish tips to body feathers are broad and produce a speckly appearance. The pinkish 'bloom' found in adults is lacking and because the dark feather centres are smaller the general effect is of a lighter and browner bird, although in fact the tone is very little different, about OOS/9/6.

Seasonal change, mainly due to abrasion, is evident; the worn plumage is appreciably duller. Four specimens, however, from widely scattered localities are rather lighter and browner in tone, about midway between true juvenile and adult. This difference may indicate a developmental variation, a distinctive first adult dress for example, or it may be an index of individual variation.

Samples of population from the coastal plains around Port Nolloth show a high percentage of 'grey' phase birds. Roberts made a very interesting sectional picture of the population in this area when he collected between Klipfontein and Port Nolloth. Although his data suggests that 'grey' birds were limited to a narrow coastal belt about 25 miles in width (see Table below), there are three specimens of 'red' birds in the National Collection which were obtained at Port Nolloth: two by Charles Reid in 1902 and one by C. H. B. Grant in 1903. Also out of six specimens collected by Meinertzhagen on the Klipfontein escarpment, about 45 miles inland, one is a 'grey' bird. Meinertzhagen's specimen is the farthest inland record of the 'grey' phase.

No.	Locality	Date	Colour
766	Klipfontein	17.8.37	} 'Red'
798	25 miles east of P.N.	19.8.37	
800	" "	"	
801	" "	"	
802	" "	"	
808	Port Nolloth	"	} 'Grey'
809	"	"	
811	"	"	
822	"	20.8.37	
841*	25 miles east of P.N.	"	
836	" "	21.8.37	} 'Red'
840	" "	22.8.37	

* Date suggests that this number should be 831.

Dimensions of 63 specimens from this region, including 'grey' birds from the coastal plains, are as follows:

<i>Sex</i>	<i>No.</i>	<i>Wing</i>	<i>Tail</i>	<i>Bill</i>	<i>F.P.</i>
Juv. { ♂ ♀ ♂ ♀ ?*	38	86-100	62-74	17-20	28-36
	21	84-93	58-67	16-20	26-32
	2	89-91	70-74	17	28-32
	1	86	64	18	32
	1	90	65	19	28

* Smith specimen: co-type of his *Alauda lagepa*.

Birds from this region have a higher degree of chromaticity than those in the Cape, Berg River, and Lambert's Bay areas; they are nearest to the Swellendam and Deelfontein specimens, but a shade lighter in tone, with a slight narrowing of the dark feather centres and a purer white on under parts. There is an obvious difference between juvenile and adult plumages due mainly to a great reduction in the width of the dark feather centres in juvenile feathers and the lack of pinkish 'bloom', typical of adults in fresh plumage. There is an indication that there may be an intermediate plumage between juvenile and full adult, and that coastal populations in the Port Nolloth area consist predominantly of 'grey' phase birds. These latter are somewhat similar in appearance to those found farther south at Lambert's Bay and Saldanha Bay. There is a large enough sample to show that females are slightly smaller than males and that the smaller samples from other areas fit into the range of measurements for this region.

Orange River Mouth

The Karroo Lark populations so far examined are readily linked together by similar dimensions and plumage pattern. (The significance of the colour difference will be discussed later.) Immediately to the north-west of these populations, near the mouth of the Orange River, there are birds which appear to be geographical representatives of the Karroo Lark in which the dark streaks in the pattern are considerably reduced with a consequently higher proportion of the more brightly coloured areas (see Plate 37). It is not known exactly where the change takes place and how it is effected. There is no obvious sudden change in the character of the country, which consists of monotonous rolling tracts of low scrub which gradually thin out to almost pure desert near the Orange River. The change was first observed in a specimen collected by the British Museum Expedition along the coast 38 miles north of Port Nolloth and a few miles south of the Orange River. The difference lies almost entirely in reduction in the width of the dark centres of the feathers. In the body feathers of the upper parts dark centres have almost completely disappeared, or are reduced to a thin and rather diffuse dark streak of the same general colour on the rest of the feather. Streaking on the breast is slightly reduced and is absent on flanks and belly. There is very little change in the pattern of wing and tail feathers.

The specimen mentioned above, and six others collected at Grootderm, about 14 miles up the Orange River, belong to the 'grey' group, while two others belong to the 'red' group. The 'red' tone is almost identical with that found in Springbok birds, about OOS/8/5, while the 'grey' tone is about OOS/9/4 and almost identical with Robert's 'grey' specimens from near Port Nolloth. Both the 'red' specimens were found in the company of 'grey' birds, and all are in the process of total moult. Three other specimens were found in the Transvaal Museum which had been collected in 1942 at Orange Mouth. They are 'grey' birds, matching our specimens, except that they are stained with red soil or sand. Taken in September they must have been breeding. Dimensions of the twelve specimens are as follows:

TAXONOMY OF THE KARROO AND

<i>Sex</i>	<i>No.</i>	<i>Wing</i>	<i>Tail</i>	<i>Bill</i>	<i>F.P.</i>
♂ R.	2	86-89	63-67	20-21	28-30
♂ G.	6	86-96*	63-68	20-21	26-30
♀ G.	4	82-87	61-64	17-19	26-27

R. = 'red' phase. G. = 'grey' phase.

* Next smallest are two specimens at 92.

Important points to note about these Orange River specimens are that reduction in the amount of streaking is the only apparent difference from specimens in the Port Nolloth and Springbok areas, and that in the narrow coastal belt birds are predominantly 'grey'. If the streaks were reduced to the point of disappearance the effect would be the appearance of the Red-back Larks which belong to regions north of the Orange River. Another connecting link between Karroo and Red-back larks is found in specimens from the next area to be considered.

Witputs Area

Witputs, a lonely police outpost, lies about 60 to 70 miles due north of Grootderm and at the southern tip of the Huib Plateau. A series of eighteen specimens was obtained there in late January. Environmental conditions were very similar to those in which the Karroo Lark lived in Little Namaqualand—namely, low sparse scrub mixed with prostrate succulents (see Plate 38a). Although taken a month later than the Grootderm specimens the adults, of which there are thirteen, are only just completing moult. The adult plumage is darker and richer in colour than the 'red' Grootderm specimen, about OOS/7/6 (cinnamon-brown) as against OOS/8/5.

Dark centres to body feathers of the upper parts have almost completely disappeared, although in occasional specimens—one out of the thirteen collected—the markings are rather more distinct and comparable with the Grootderm specimens (see Plate 37). There is also an appreciable narrowing in the dark centres on the inner secondaries and central tail feathers. Little change is noticeable on the under parts except that the white is inclined to have a slight buffish tint. The worn breeding plumage is not represented.

The five young birds are in moult and illustrate the transition from juvenile to first adult plumage. The moult appears to be a partial one, for there is no indication of wing and tail feathers being shed. Body moult proceeds in an anterior-posterior sequence. The difference in colour-tone between the two plumage phases is very apparent: the juvenile is a pale brown, about OOS/9/5, contrasting strongly with the OOS/7/6 of the fresh adult feathers. Interesting features are the reduction in the width of the dark centres of the central tail feathers and the increase in the width of the pinkish margins on the inner webs of the inner wing feathers. Dimensions are as follows:

<i>Sex</i>	<i>No.</i>	<i>Wing</i>	<i>Tail</i>	<i>Bill</i>	<i>F.P.</i>
Ad. {	♂ 6	92-96	69-71	20-21	29-32
	♀ 7	83-87	59-64	17-18	26-28
Juv. {	♂ 2	89-91	65-72	20	26-29
	♀ 3	78-84	61-65	17	26-30

Although the Witputs birds are clearly different to those at Grootderm, they are obviously related, for the differences are only slight quantitative changes.

Aus Area

Aus is a small village about 80 miles north of Witputs, about 60 miles inland from Luderitz Bay, and on the Namib Desert side of the main backbone range of mountains. It is easily reached by road or rail and has been a collecting centre for a number of ornithologists. Red-back larks in this area have given rise to some controversy.

Roberts (1937: 88) reported that whilst delayed by a mechanical breakdown about 30 miles north of Aus, on the Helmeringhausen road, he collected a series of larks which he claimed to be identical with *Pseudammomanes erythrochlamys* (Strickland) from Walvis Bay. Subsequently he camped 'in the flats below the hills to the west of Aus', where he obtained a further series of Red-back larks. These he considered were different from *P. erythrochlamys* 'in having the inner lining of the wing-quills with only a trace of pinkish on the inner edges—not broadly pinkish—and the middle tail feathers above with a broad central stripe of dark greyish-brown; the outer tail feathers are also on the whole darker, only the outer web of the outermost being pinky-whitish, the rest of the feather blackish with only the tip pale; the outer webs of the primaries above is only very thinly or not at all pinkish'. He also gives the following dimensional differences:

<i>Sex</i>		<i>No.</i>	<i>Wing</i>	<i>Tail</i>	<i>Tarsus</i>	<i>Culmen</i>
<i>P. barlowi</i>	♂	7	93-97	68-72	24.5-26	18-19
	♀	2	83-87	61.5-64	24.5-26	16-16.5
<i>P. erythrochlamys</i>	♂	8	89-95	67-74	26-28	17-18.5
	♀	5	84-85	64-69	24-26	14.5-16

He considered that these were sufficient criteria for the recognition of a new species and gave them the name *P. barlowi*.

Hoesch and Niethammer (1940: 60) visited Aus in late December and early January 1938-1939. Red-back larks were collected only on the farm of Kubub, which is about 2-3 miles south of Aus, except for one found about 30 miles farther west, at Tschaukaib, on the road to Luderitz Bay (see Fig. 1.) On the evidence of these specimens they disagreed with Roberts, stating that the dark stripe in the central tail feathers is variable, and put his *P. barlowi* into the synonymy of *P. erythrochlamys*. They do not record that they had either found or examined typical specimens of *P. erythrochlamys*. Roberts had this advantage, for there was a specimen from the Kuiseb River in the Transvaal Museum collected in December 1928 by R. D. Bradfield.¹

It is almost certain that Roberts would have made his points clearer in the fuller account which he proposed to publish, for the important factor correlated with the difference he observed is the occurrence of large tracts of shifting sand-dunes. In his preliminary account the only clues he gives are that the birds 30 miles north of

¹ Incidentally, Roberts collected two specimens at Rooibank, 30 miles up the Kuiseb River, in September 1941: he did not have an opportunity to comment on them in print.

Aus were 'found in large numbers on some dunes, but not in the plain near by', while of those west of Aus he merely states they were 'on sandy dunes'. Details of the area in the vicinity of Aus are shown on the accompanying sketch map.

To the north of Aus the dry-bed of the Koichab River forms the southern boundary of an immense area of sand-dunes which stretches for about 200 miles northwards to Walvis Bay at an average depth of about 70 miles from the coast. The Helmering-

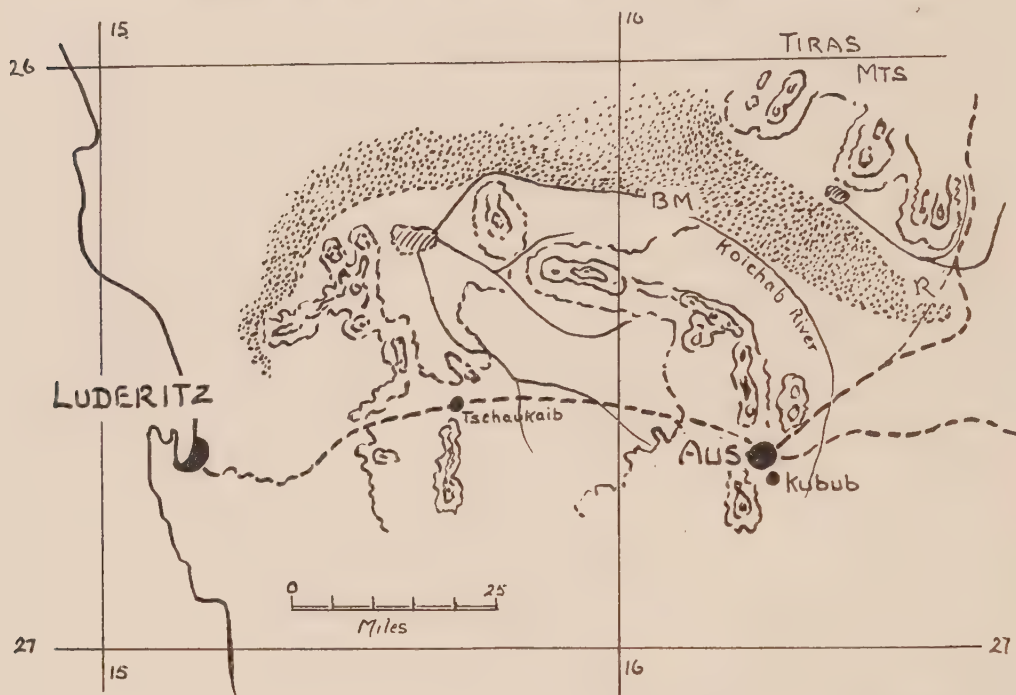


FIG. 1. Details of Aus area showing southern limit of shifting sand-dunes and localities in which Red-back larks were collected.

B.M. = B.M. Expedition collecting locality.
R. = Roberts's collecting locality.

hausen road, 30 miles north of Aus, touches an encroaching arm of the dunes. In fact it was evident that the road we used in 1950 is a new trace circumventing the dunes and that Roberts was almost certainly on the old road.

We explored the dunes about 30 miles farther west than Roberts did. They lay across our path in the form of a pinkish-red barrier of fine wind-blown sand rising several hundred feet. On the margins of the dunes there were numerous scattered clumps of a spiky grass, *Aristida* sp. Red-back larks were found living in association with this grass. (Conditions were similar to those at Tsondeb Mund shown on Plate 38b.)

South of the dunes the country consists of a jumble of granite hills and kopjes rising from plains of firmer sand and gravel covered with low scrub, varying in density according to local conditions. Red-back larks may be found almost any-

where in this scrub. Niethammer records that he found them in small parties on the western edge of the Kubub plain where there were patches of small bushes. We came across them in several places north, south, and west of Aus.

There is no doubt that Aus (scrub) birds are different. They are clearly intermediate between the Aus (dune) and the Witputs birds, which also inhabit a similar sort of scrub, but smaller and sparser, frequently with a high proportion of succulents, and growing on a redder type of sand. Twelve specimens collected by us near Aus in late January and early February are adults just completing moult and are in perfectly fresh plumage. They are much paler than the Witputs birds, about OOS/9/5 as against OOS/6/6. Dark centres to body feathers on the upper parts are never blackish as they sometimes are in Witputs specimens, but are a darker tone of the same general colour. Dark streaks on the central tail feathers are on the whole appreciably reduced, and on the innermost secondaries are little more than the thickness of the shaft. Below, the streaking on the breast is much less distinct (see Plate 37). In Roberts's specimens, collected in July, the plumage is fairly worn, but the only change is in the loss of most of the pinkish 'bloom' which appears to be characteristic of all fresh adult plumages. There are no juveniles. Dimensions of British Museum and Transvaal Museum specimens are:

<i>Sex</i>	<i>No.</i>	<i>Wing</i>	<i>Tail</i>	<i>Bill</i>	<i>F.P.</i>
♂	14	91-100	67-76	19-21	27-38
♀	6	86-92	63-71	18-19	29-32

Namib Dunes

North of Aus

The Aus (scrub) birds are more like the sand-dune specimens from 30-40 miles north of Aus than the Witputs birds. Of six specimens collected on the dunes on the 31st of January, four are in the final stages of moult, while two are in half moult and still showing the appearance of the old worn plumage. The colour of the upper part in the fresh and worn plumage is indistinguishable from that of the Aus (scrub) birds, being about OOS/9/5 when fresh and about OOS/10/5 when faded. The main difference lies in the extreme narrowness of the dark centres of the central tail feathers which are reduced more or less to the width of the shaft. On the innermost secondaries it has disappeared altogether, even the shaft being the same colour as the web. Differences on the under parts are more noticeable: the streaking on the breast is reduced very considerably, both in the number of feathers with dark centres and the width of the dark centre, which is not blackish, as in the population samples already examined, but about the same colour as the upper parts (see Plate 37). Also the white of the under parts is washed with pale buff. In adults there is a greater amount of pinkish on the underside of the wing (on the inner margin of the inner web). It may be noted that this and other characters, such as the narrower width of dark centres on central tail feathers and inner secondaries, are associated with juvenile plumage in the Aus (scrub) and Witputs areas.

In the preserved specimens the bills of the dune birds have dried off to a dark

brownish-horn colour, whereas in the scrub birds they are blackish-horn. This difference is not reflected in the data noted in the field, but direct comparison of fresh specimens was not made and unless some standard colour nomenclature is used, field descriptions, even of the same colour, often vary from day to day.

<i>Sex</i>	<i>No.</i>	<i>Wing</i>	<i>Tail</i>	<i>Bill</i>	<i>F.P.</i>
♂	8	91-97	68-71	18-20	28-32
♀	9	83-90	60-70	16-20	23-29

Tsondab Mund

A series of specimens was obtained at Tsondab Mund, about 180 miles north of Aus and 20 miles south of the Kuiseb River. The Tsondab is a seasonal river which has its origin in the Naukluft Mountains, and disappears in the sands of the Namib Desert, about 50 miles from the coast. It lies in a gravel plain flanked by mountainous dunes which eventually form a barrier across its course (see Plate 38*b*). The dunes are very similar to those at Aus. A series of eighteen specimens was obtained on the 5th and 6th of March, of which one is in juvenile plumage. The adults are either in extremely worn breeding dress, with gonads large but apparently subsiding, or just beginning to moult. They are, therefore, about two months later in their breeding-cycle than the population near Aus. A few are fairly well advanced in moult, sufficient to show that the colour of the fresh plumage is exactly similar to the Aus (dune) birds, being about OOS/9/5 when fresh and fading to about OOS/10/5. On the underside also colours and markings are identical, but in the worn condition the breast stripe almost disappears (see Plate 37). The juvenile is similar to the worn adult in colour, but is distinguishable by pale tips to most of the feathers, giving it a speckled appearance. Dimensions are:

<i>Sex</i>	<i>No.</i>	<i>Wing</i>	<i>Tail</i>	<i>Bill</i>	<i>F.P.</i>
♂	11	88-98	62-70	19-21	25-33
♀	6	83-88	60-66	18	25-31
Juv. ♀	1	82	60	16	29

Walvis Bay

The Kuiseb River forms the northern boundary of the main Namib sand-dune area. It is not certain exactly where C. J. Andersson obtained the specimens on which Strickland based his descriptions of *Alauda erythrochlamys*. Of those in the British Museum two carry the information 'sandy flood bed of the Kuiseb River'. He was stationed both at Walvis Bay and Sweppmansdorp (now Rooibank), about 30 miles up the Kuiseb. Roberts obtained specimens in 1941 at Rooibank 'at the edge of the sand dunes'. We spent a few days higher up, at Swartbank, but were on the north side and separated from the dunes by the Kuiseb in flood.

Of six specimens in the British Museum, two adults are dated November. They are in very worn plumage and compare exactly with worn and faded specimens from Tsondab Mund, about OOS/10/5. Of two in juvenile plumage one is dated May, and judging by the extent of wearing compared with a March specimen from Tsondab

Mund, must have been hatched out about the same month. It seems, therefore, that the breeding-cycles along the Kuiseb and Tsondeb coincide. Dimensions are:

Sex	No.	Wing	Tail	Bill	F.P.
♂	4	90-93	67-68	19-21	26-28
♀	1	89	62	17	30
Juv. ♂	1	87	86	18	—
?	3	89-90	67-68	17-19	28-29

Roberts and Meinertzhagen quote Swakopmund in the distribution of this lark. So far as I know specimens have not been found in that locality. Although there are dunes near the coast at Swakopmund we found them entirely lacking both in *Aristida* grass and Red-back larks. Roberts also mentions that Andersson took eggs of this species at Otjimbingue, and these are in the British Museum. As the eggs are not accompanied by the birds they belonged to their proper identification will remain uncertain until they can be compared with eggs known with certainty to belong to *A. erythrochlamys*.

DISCUSSION

Dimensions

The localities mentioned above are indicated on the accompanying map (Plate 36). The sample of specimens from each locality is, in the majority of instances, too small in relation to the number of factors affecting dimensions, such as, for example, the amount of wear, to obtain accurate statistical figures, but the measurements taken are approximate enough to give a general picture of correlation between the various populations. The only factor which need be taken into account is sex, but even here a high degree of accuracy in sexing cannot be claimed. Juvenile measurements do not appear to vary noticeably from those of adults. In any case, if they were to be dealt with separately, account would have to be taken of the first adult compound plumage in which juvenile wing and tail feathers are retained, but this stage does not appear to be recognizable. Measurements of males and females, including the juveniles of each sex, from the various localities, are compared in Tables 1 and 2,

TABLE 1. *Summary of the Dimensions of Males of All the Populations of Karroo and Red-back Larks*

Locality	No.	Wing	Tail	Bill	F.P.
Cape Flats	5	88-94	62-68	18-20	28-32
Berg River	3	91	62-68	19-20	31-32
Lambert's Bay	1	92	71	19	—
Swellendam	2	92-94	66-69	15	28-29
Namaqua-Bushman-land Region	40	86-100	62-74	17-20	28-36
Orange River	8	86-96	63-68	20-21	26-30
Witputs	8	89-96	65-72	20-21	26-32
Aus (scrub)	14	91-100	67-76	19-21	27-38
Namib: Aus (dunes)	8	91-97	68-71	18-20	28-32
Tsondeb Mund	11	88-98	62-70	19-21	25-33
Walvis Bay	5	87-93	67-68	12-21	26-28
Total	105	86-100	62-76	17-21	25-36

TABLE 2. *Summary of the Dimensions of Females of All the Populations of Karroo and Red-back Larks*

Locality	No.	Wing	Tail	Bill	F.P.
Cape Flats	4	82-88	56-61	18-20	27-33
Berg River	1	88	61	20	27
Swellendam	1	84	62	16	26
Namaqua-Bushman-land Region	22	84-93	58-67	16-20	26-32
Orange River	4	82-87	61-64	17-19	26-27
Witputs	10	78-87	59-65	17-18	26-30
Aus (scrub)	6	86-92	63-71	18-19	29-32
Namib: Aus (dunes)	9	83-90	60-70	16-20	23-29
Tsondab Mund	7	82-88	60-66	16-18	25-31
Walvis Bay	1	89	62	17	30
Total	65	78-93	56-71	16-20	23-33

which summarize the full data given in the 'Tables of Measurements' at the end. From this it is seen that none of the samples, or group of samples, under examination is readily separated from the others.

The uniformity apparent in this general picture can be tested by examination of the frequencies of the dimensions taken. It seems legitimate to emphasize any small differences by combining lengths of wing, tail, and bill (first primary measurements being omitted only because they are less complete). This has been done separately for males and females and the result is shown logarithmically in Fig. 2. Males have a mean value of 180 mm. and females 167.5, with standard deviations of 6 and 5 respectively. The main point, however, is that the distributions are approximately symmetrical, suggesting that the sample belongs to a more or less uniform population.

In fact the sample is so uniform that a cline is not even evident. When Namib dune populations are tested against populations from the Namaqua-Bushman-land area an almost exact correlation is obtained. For instance, in Fig. 3 the size-frequencies of the wing lengths of the males of these two populations are shown as histograms and are plotted logarithmically. The difference of the means (0.1 mm.) is so low that it is clearly of no significance; about 95 per cent. of random samples of a single population would show a mean difference of this magnitude, or greater.

At this point it may be noted that Roberts (1937: 97) distinguished his *Calendulauda guttata calviniensis* only on size; he gives wing measurements as ♂ 99, ♀ 90 (by my measurements 98 and 89), both of which lie within the range given here. Apparently he only had two specimens and a larger sample from the same locality obtained by Meinertzhagen shows a wider range: 5 males, wing 90-96, 2 females, wing 85-89. In this short series the mean wing length of the males, 93.9 mm., differs from the mean length of the Namaqua-Bushman-land populations by only 1 mm., and the type male alone differs from the mean by an amount greater than the standard deviation of the populations.

Colour and pattern

In general appearance birds are coloured above in various tones of reddish-orange which is either plain or marked with very dark streaks: the under parts are whitish,

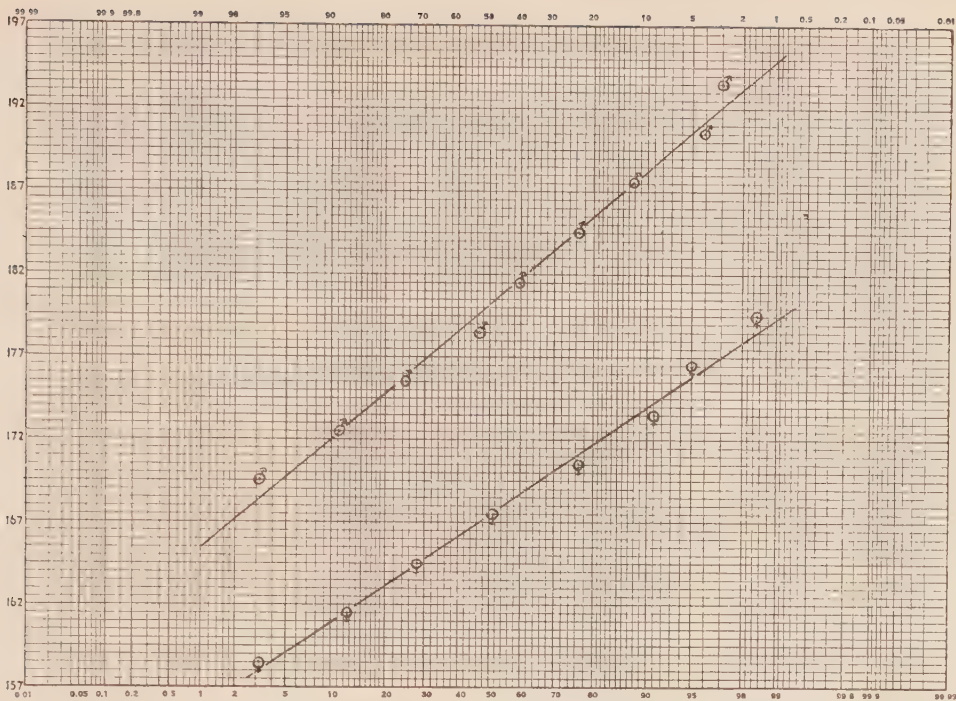


FIG. 2. Size-frequencies of combined wing, tail, and bill lengths of 97 males and 64 females from all the populations of Karroo and Red-back larks.

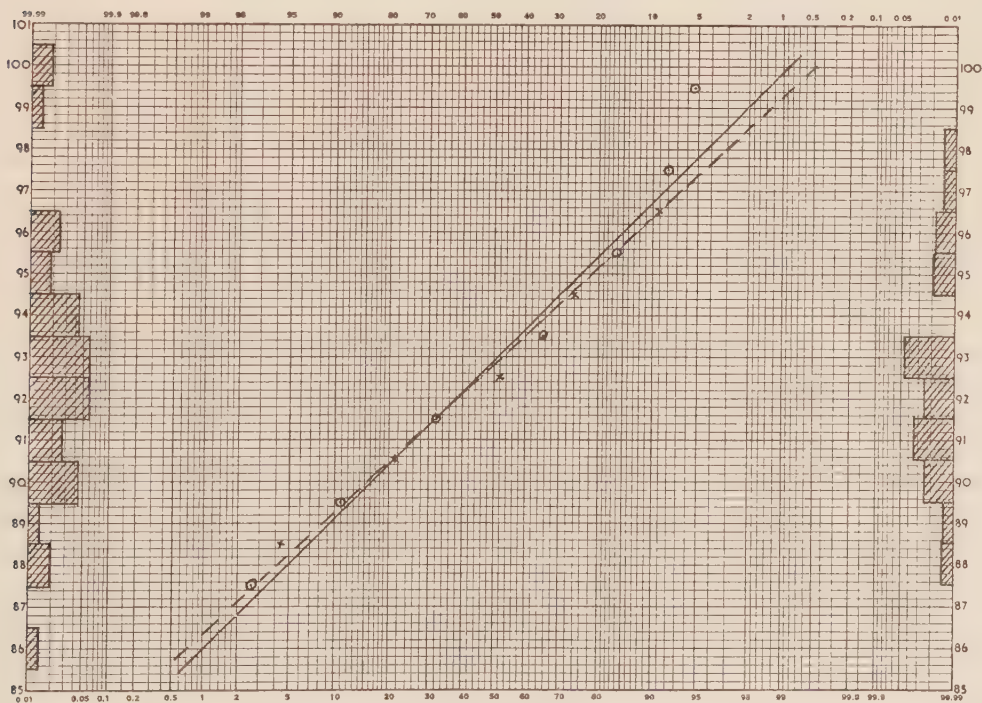


FIG. 3. Size-frequencies of wing lengths in males of: (a) Namaqua-Bushman-land populations, 37 specimens; circles and unbroken line. Mean 92.9 mm.; σ , 3.0. (b) Namib dune populations, 23 specimens; crosses and broken line. Mean 92.8 mm.; σ , 2.7.

with dark streaks at least on the breast. In all body-feathers, both above and below, the basal portion (at least two-thirds or more) is uniformly very dark grey. The usual pattern of the exposed tip consists of a dark central streak, flanked by a coloured area of medium tone, and a thin pale outer margin (see Fig. 4). On the whole these parts are fairly sharply defined. The pale outer margin is most evident in the juvenile plumage, where it forms a fairly broad whitish tip. Pale margins are also present sometimes in new adult feathers, but they are usually very narrow

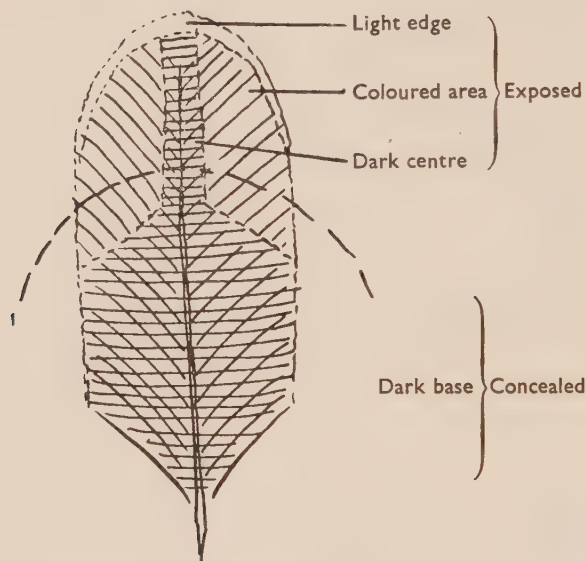


FIG. 4. Diagrammatic representation of the colour pattern of a feather taken from the centre of the back.

and soon wear off. In some localities, particularly the Springbok area, broad whitish margins to the feathers of the wing coverts contrast sharply with blackish centres and form a pattern which persists throughout the season.

The general colour of the upper parts is mainly determined by the coloured area of medium tone. It is this colour which has been identified and used for comparative purposes. In all the specimens examined the colours of this area belong to the same hue, as identified by the *Colour Atlas*. They vary only in the degrees of lightness and chromaticity. An attempt has been made to show the extent of this variation in Fig. 5. Two general points of special interest which are illustrated are that the less colourful and rather paler forms are distributed along the coast from Cape Town to the mouth of the Orange River; otherwise birds of the main population have the same chromatic value, varying only in degree of lightness.

As well as variation in tone the coloured area varies in the amount of the exposed tip it occupies. In the northern Namib birds it occupies the whole of the exposed tip, the dark centres being non-existent except in a few of the breast feathers. In Aus birds the dark centres are slightly more pronounced, and become more so at

Witputs and the Orange River. In the Springbok region there is a sudden increase in the ratio of dark centres to coloured area, so much so that in this particular feature birds at Orange River mouth are more unlike birds from Port Nolloth, only 60 miles

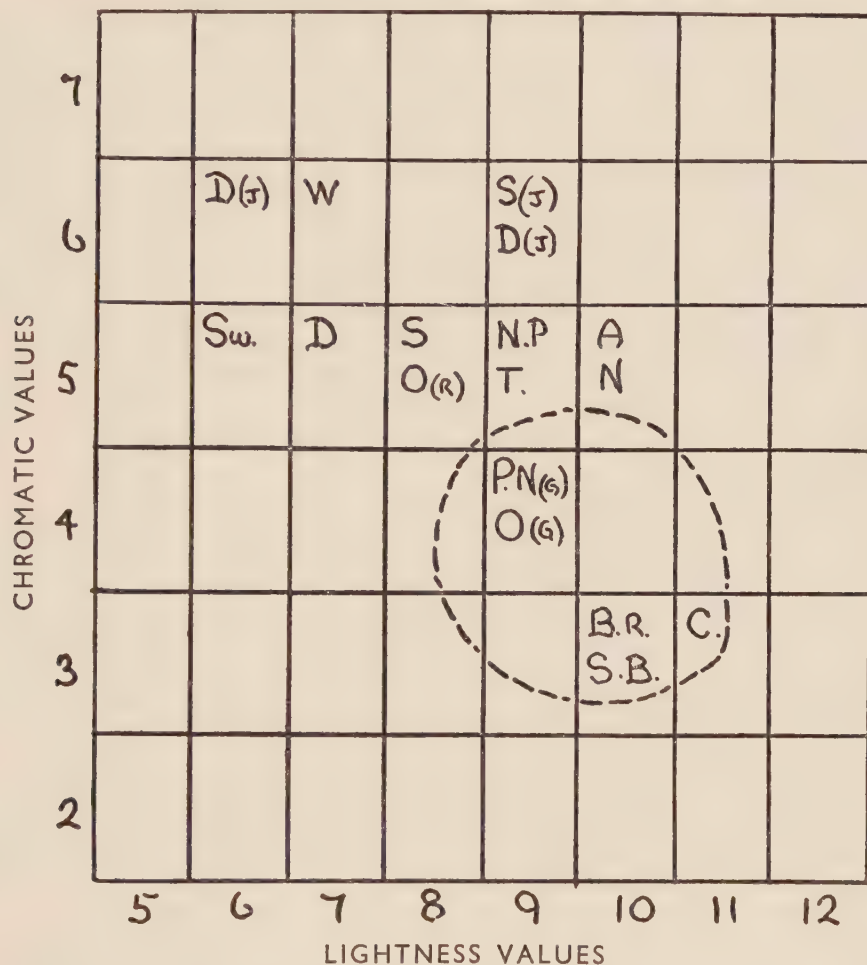


FIG. 5. Graphical representation of colour variation based on Villalobos's *Colour Atlas*. The area ringed indicates the grey coastal population.

A = Aus; B.R. = Berg River; C = Cape; D = Deelfontein; N = Namib; N.P. = Nels Poort; O = Orange River; S = Springbok; SW = Swellendam; S.B. = Saldanha Bay; T = Traka; W = Witputs; (G) = Grey phase; (R) = Red phase; (J) = Juvenile.

away, than birds from the Namib dunes. Birds from Springbok southwards could be described as being heavily streaked, with a tendency in some places in the south for the dark centres to occupy nearly the whole area of exposed feathers. Birds north of Springbok are lightly streaked, with a tendency in the north for the coloured area to occupy nearly the whole of the exposed part of the feather. There is therefore a more or less graded change in pattern correlated with north and south

distribution. There does not seem to be any correlation between colour and pattern. The populations which have similar broad streaks are variable in colour.

Developmental stages

The juvenile plumage is distinct from the adult plumage. Most of the feathers have a fairly broad whitish margin at the tip, the dark central streaks are narrower, and in general appearance the plumage lacks the particular pinkish bloom which seems to be typical of all adult fresh plumages. On the whole the colour of juvenile plumages most closely resembles worn and faded adult plumages, but it may be noted that of two young birds obtained in the Deelfontein area, by the same collector in 1901, a very young March specimen is more richly coloured than adults, while a rather worn January specimen is rather lighter and browner and agreeing with the more usual relationship between juvenile and adult. The significance of this difference does not seem to be apparent at this stage. Moulting from juvenile to first adult plumage seems to take place slightly later than the adult post-breeding moult. Only the body-feathers are moulted and therefore the first adult plumage is compound. It may be noted that it is possible that this stage may be rather less deeply coloured in populations of deeply coloured adults. Moulting proceeds in an anterior-posterior sequence.

In the adult plumage there is an appreciable seasonal change due to wear and fading, new feathers having a noticeable pinkish bloom. In the material studied there is no indication of pre-nuptial moult, partial or otherwise, so that the moult cycle seems to be Juvenile → Compound Annual → Simple Annual (repeating). In the adult post-breeding moult there is a complete change of feathers. Body moult proceeds in the same sequence as in the juvenile and is usually rather ahead of wing and tail, in which the sequence follows the normal pattern, beginning at the junction of primaries and secondaries in the wing and the central pair of feathers in the tail.

The pattern of development therefore is uniform throughout the group, and in the rather limited material examined there seems to be rather less variation in the juvenile than in the adult, the former being constantly browner in colour because of the narrower dark feather streaks.

Breeding-cycle

In the northern sector of the range there are indications of a progressively later breeding-cycle correlated with decrease in latitude. Birds at Kamieskroon (30° south) had commenced post-nuptial moult in late November, whereas at Tsondab Mund (24° south) it was early March before birds reached the same stage. In the southern sector, however, the correlation is confused, as might be expected when the distribution spreads eastwards. The factors determining the breeding-cycle have not been investigated. A similar gradation in breeding-cycle was found in the Long-bill lark, *Certhilauda curvirostris* (see Macdonald, 1952).

Habits

Regarding the habits of these birds, Smith (1843) stated of his *A. codea* that 'when

disturbed they fly to a distance, and then perch upon the summit of some dwarf shrub'; and of his *A. lagepa* 'on descending from its aerial flight commonly perches on the shrub nearest to the point where it descends'. Notes by Andersson (1872), according to Gurney, are not related with certainty to any birds belonging to this group. Layard (1867: 209) under *A. codea* records some observations on the habits of nesting birds. Grant, in Sclater (1911: 256), records (under *Mirafra nivos*—an invalid name, see footnote p. 321) that 'it frequents open flats and the tops of mountain ranges, and is usually in pairs. The call is a whistle, and the bird is fond of perching on the tops of low bushes and scrub, especially if disturbed'. Jack Vincent found his birds at Blaauwberg beach 'among low scrub on sand dunes'. An account of the nesting and other habits of the Cape race is given by A. W. Vincent (1946: 466). Roberts makes a few references to habits. Hoesch & Niethammer (1940: 224) recorded of the Red-back lark that they found it in small parties on the western edge of the Kubub (Aus) plain where there were patches of small bushes, and also that they run very fast over the sand and stop motionless in the cover of bushes.

Of birds in the Springbok area we noted that they were usually found in places where scrub became sparse and stunted and the soil loose and sandy or gravelly. On the ground they ran vigorously. They were never seen to make more than short low flights which were rather weak and fluttering. In our experience they always landed on the ground, making what appeared to be a 'pancake' landing, but they would jump on to low scrub. Local populations seemed to be thinly scattered in ones and twos. At Grootderm, near the mouth of the Orange River, they were found in rather more arid conditions, in depressions between low hills on soft sand with scattered stones and rocky outcrops, and practically no scrub, but what scrub there was the birds used for cover, running from one tuft to another. On the few occasions on which observations were made none were seen to perch. At Witputs they were again associated with open scrub, about 18 inches high, and soft sand. They were relatively plentiful, usually in scattered pairs, but took a good deal of finding until one became acquainted with the places they liked and their habit of creeping about, mouselike, of standing motionless under a clump of scrub, or of running at great speed with head down, but then frequently giving themselves away by jumping up on top of the scrub. They were difficult to flush, and flew low for very short distances. At Aus the picture was much the same: birds were most frequently found on sandy patches with sparse stunted scrub, and when disturbed ran for long distances. Sand-dune birds from north of Aus and Tsondab Mund were not noticeably different. They lived in close association with *Aristida* grass, sheltering in the clumps, or running with amazing speed from one clump to another, easily outpacing our clumsy efforts to catch up with them. Probably because of this we noted that they seemed to be wilder than other Red-backs, but then they were living in a more exposed environment. They sometimes jumped up on top of the grass tufts, but were never seen to alight there from flight. A display flight was noted, in some ways reminiscent of the skylarks. Birds climbed up to 100 feet or so then fluttered horizontally for a short distance uttering a rather musical note which was written down as 'chek-chek-chek-chek-tae': they would drop 10 or 20 feet, flutter again for a short distance, then drop suddenly to earth, and run. A variation of this note was

sometimes uttered by a bird standing in or on a clump of grass: it was recorded as 'tchee-tchee-tchee-chr-r-r-r'.

It seems clear, therefore, that the birds known as Karroo and Red-back larks live in similar habitats, namely, areas of soft sand where vegetation is sparse, and that there seems to be a good deal of similarity in their habits.

Nomenclature

It would be convenient to summarize the foregoing and leave the matter there, for it is obvious that much more data has to be obtained before an accurate picture of the taxonomy of this group can be presented. But for cataloguing purposes the question of nomenclature has to be dealt with.

The general picture is of a group of populations which are practically identical dimensionally, but variable in several other characteristics, particularly colour-tone and feather pattern. These variations appear to be independent of each other, but, for the most part, they can be correlated with distribution. Streaking is heaviest in the southern birds and almost completely disappears in the northern. Colour bears a broad general relationship to soil colour. In fact, putting both together, plumage colour and pattern bears some relation to soil colour and pattern. In the smooth fine sands of the Namib dunes birds are plain; whereas in the Springbok area, for example, where there is much more gravel and stones and prostrate vegetation breaking up the surface of the sandy localities frequented by these birds, they are patterned. A striking colour variation is associated with a narrow coastal belt which has greyish sands and frequent coastal fogs.

It seems highly probable that these variable characteristics are largely phenotypic in origin and of less significance taxonomically than those which are less variable, such as dimensions; and therefore, taking into consideration the allopatric nature of the distribution, it can be concluded that all these various populations are representatives of a single species.

This lark seems to be related to the Long-bill lark, *Certhilauda curvirostris*, which occupies rather stonier types of country within practically the same area of distribution, and is the type species of the genus *Certhilauda*. The specific name of the Karroo and Red-back larks therefore is *Certhilauda albescens* (Lafresnaye).

The question as to which populations should carry distinctive names is more difficult to answer. Grey birds appear to be restricted to coastal localities between the Cape and the Orange River. Cape area populations seem to be entirely grey and of a distinctive tone and therefore may be given racial status. But from Lambert's Bay north to Port Nolloth populations are mixed grey and red, though predominantly the former. This mixing seems to have been the main reason for Roberts's recognition of two species and Meinertzhagen's reversion to a single polymorphic Karroo Lark not divisible into races. My own opinion is that the coastal strip in which grey birds predominate is no wider than the zone of overlap or infiltration which one would expect to find between two geographical forms whose differences are not apparently intergraded (see map, Plate 36). Some overlap may be due to birds wandering in the non-breeding season and the balance of grey over red being maintained no doubt by those factors which are the primary cause of a grey phase being

established in this area. I think, therefore, that it presents a better picture of the taxonomy of the species to give them racial status and, until more is known about them, to tack them on to the Saldanha Bay form.

The inland red populations are, in my opinion, not well enough known as yet, throughout their wide distribution, to be regarded as anything other than a single race, *guttata*. In the north the scrub and dune populations are distinct and have been named, but in the Witputs area, and near the mouth of the Orange River, there are distinct populations for which names have to be provided. Regarding the latter, the type is one of a series of grey birds, and it may well be that when more becomes known about populations in this area that an inland red form will be distinguished.

The nomenclatorial picture, therefore, is as follows:

Certhilauda albescens (Lafresnaye)

(1) *C. a. albescens* (Lafr.)

Alauda albescens Lafresnaye, *Rev. Zool.* 1839: 259: Blaauwberg Beach, Table Bay.

Alauda codea Smith, *Zool. of S. Africa*, 1843, pl. 87: Karroo plains, between the Oliphant's and Orange Rivers. (Probably Cape Flats.)

Characteristics. General appearance of upper parts light drab, broadly streaked with sepia. Below whitish broadly streaked with sepia on breast, lightly streaked on flanks and almost entirely without streaks on belly.

Distribution. Cape Flats, as far north as Berg River.

(2) *C. a. saldanhae* (Roberts)

Calendulauda albescens saldanhae Roberts, *Ann. Trans. Mus.* 1936: 258: Saldanha Bay, Cape Province.

Characteristics. Similar to previous race, but with a pinkish-rufous wash on the upper parts. The extent to which this feature is constant in the areas indicated is not certain.

Distribution. Saldanha Bay, Berg River, Lambert's Bay, and northwards along the coast to Port Nolloth.

(3) *C. a. guttata* (Lafr.)

Alauda guttata Lafresnaye, *Rev. Zool.* 1839: 259: Elephant's (Oliphant's) River, Cape Province.

Alauda legepa Smith, *Zool. of S. Africa*, 1843, pl. 87: between the Berg and Orange Rivers.

Calendulauda albescens karuensis Roberts, *Ann. Trans. Mus.* 1936: 258: de Aar, Cape Province.

Calendulauda guttata calviniensis Roberts, *Ostrich*, 1937 (97): Calvinia, Cape Province.

Characteristics. Similar to previous races in the extent of sepia streaking above and below, but general colour of upper parts about snuff-brown to Mikado-brown.

Some variation in colour is evident, but so far not clearly associated with distribution.

Distribution. Inland areas from Swellendam in the south, north-east to de Aar and west to Springbok, and apparently sometimes reaching the coast, as at Port Nolloth and Lambert's Bay.

(4) *C. a. patae* new race

Characteristics. Upper parts very lightly streaked and dark central streak on inner secondaries and central tail feathers much reduced. Below, streaks confined entirely to breast. Two colour phases known from the type locality, one similar to the general colour of *C. a. guttata* and the other to the general colour of *C. a. saldanhae*.

Distribution. South bank of the Orange River near its mouth to coast about 10 miles south.

Type. One of the 'grey' phase. Male; collected at Grootderm, Orange River, Little Namaqualand, lat. 28° 31' S., long. 16° 38' E., alt. 500 ft., on 17th December 1949 by the British Museum South West Africa Expedition (1949-1950). Register number 1950:50:936. Wing 89, tail 67, bill 21. Iris brown, legs pale yellow-grey, bill black. Approaching final stages of moult.

Remarks. The series consists of seven 'grey' phase and two 'red' phase, obtained in mid-December: three 'grey' specimens in the Transvaal Museum were obtained at Orange Mouth in September.

(5) *C. a. cavei* new race

Characteristics. On the whole rather less streaked above than the Orange River birds, and upper parts darker and richer in colour than 'red' specimens from that area, about cinnamon-brown. Streaking below much the same.

Distribution. At the southern end of the Huib Plateau in the vicinity of Witputs, Great Namaqualand.

Type. Male; collected 5 miles south-west of Witputs, Great Namaqualand; lat. 27° 35' S., long. 16° 42' E., alt. 4,000 ft.; on 26th January 1950, by the British Museum South West Africa Expedition (1949-1950). Register number 1950:50:922. Length of wing 96, tail 71, bill 21. Iris dull brown, legs pale grey, bill dark grey.

Remarks. Eighteen specimens, three of which are juvenile, were obtained in late January.

(6) *C. a. barlowi* (Roberts)

Pseudammomanes barlowi Roberts, *Ostrich*, 1937: 95: 8 miles west of Aus, Great Namaqualand.

Characteristics. Plain above, with no indication of dark central streaks on body feathers: streaks on inner secondaries and central tail feathers reduced to little more than a thin line. General tone of colour much lighter than Witputs birds,

about sayal-brown. Below, dark streaks on breast distinctly lighter, narrower, and occupying a smaller area: white ground colour washed with pale buff. Bill, blackish-horn.

Distribution. Vicinity of Aus, Great Namaqualand: extending at least 20 miles west, 6 miles north, and about 3 miles south.

(7) *C. a. erythrochlamys* (Strickland)

Alauda erythrochlamys Strickland, *Contr. Orn.* 1852: 181: Damaraland (probably Kuiseb River near Walvis Bay).

Characteristics. Plain above and similar in colour-tone to previous race, but lacking dark centres to inner secondaries and central tail feathers. Below, streaking on breast much reduced, and dark cinnamon-brown rather than sepia; white ground colour more washed with buffish; and more pinkish-buff on under-side of wing. (It may be noted that several of these features are found in the juvenile stages of *C. a. barlowi* and *C. a. cavei*.) Bill, brownish-horn.

Distribution. Namib sand-dune area from the Koichab River basin just north of the Aus, north to the Kuiseb River as far as Walvis Bay, and inland as far as the dunes extend and apparently where spiky *Aristida* grass occurs.

SUMMARY

1. Samples of various populations of Karroo and Red-back larks have been examined, particularly as regards dimensions, colour, pattern, moult, breeding-cycle, development, habits, and habitat.

2. The differences found are no greater than might be expected in random samples of the same species, and it is concluded that Karroo and Red-back larks can be regarded as one species, *Certhilauda albescens* (Lafresnaye).

3. Variation in colour and pattern are broadly correlated with the colour of the soil and the pattern of the environment; plainness being associated with an environment of smooth sand and streakiness with a broken pattern.

4. Although colour and pattern vary independently, seven geographical races based on these characteristics can be recognized. Two are newly described.

5. It is noted that data is still very inadequate and much still remains to be found out, particularly as regards distribution and variation in populations in Cape Province, and that the racial picture presented for birds in that area may be subject to amendment.

REFERENCES

- ANDERSSON, C. J. 1872. *The Birds of Damaraland*. xlviii+394 pp., 3 figs. London.
 AYRES, T. 1874. Additional list of and notes on birds obtained in the Republic of Transvaal. *Ibis*, 1874: 101-107.
 HARDING, J. P. 1949. The use of Probability Paper for the graphical analysis of polymodal frequency distribution. *J. Mar. biol. Ass. U.K.*, 28: 141-153.
 HOESCH, W., & NIETHAMMER, G. 1940. Die Vogelwelt Deutsch-Südwestafrikas. *J. Orn., Lpz. Supplement*, viii+404 pp., 8 pls., 76 text-figs.

- LAFRESNAYE, FR. DE. 1839. Quelques nouvelles espèces d'oiseaux. *Rev. Zool.* **1839**: 257-259.
- LAYARD, E. L. 1867. *Birds of South Africa*. . . xvi+382+xxi pp., 1 pl. Cape Town & London.
- MACDONALD, J. D. 1952. Notes on the Long-bill Lark, *Certhilauda curvirostris*. *Ibis*, **1952**: 122-127.
- MEINERTZHAGEN, R. 1951. Review of the Alaudidae. *Proc. zool. Soc. Lond.* **121**: 81-132, 6 text-figs.
- ROBERTS, A. 1936a. Ornithological Notes. *Ann. Transv. Mus.* **18**: 255-269.
- 1936b. Some unpublished Field Notes made by Dr. (Sir) Andrew Smith. *Ann. Transv. Mus.* **18**: 271-323.
- 1937. Some results of the Barlow-Transvaal Museum Expedition to South-West Africa. *Ostrich*, **8**: 84-111.
- 1940. *Birds of South Africa*. . . xxxii+463 pp., 56 pls. col. London & Johannesburg.
- SCLATER, W. L. 1911-1912. On the birds collected by Mr. Claude H. B. Grant in various localities in South Africa. *Ibis*, **1911**: 208-437, 695-741; **1912**: 1-63.
- 1930. *Systema Avium Aethiopicarum*. Pt. II. 305-922. London (Brit. Orn. Union).
- SHARPE, R. B. 1874. A study of the larks of southern Africa. *Proc. zool. Soc. Lond.* **1874**: 614-651.
- SMITH, A. 1843. *Illustrations of the Zoology of South Africa*. . . **2**, London.
- STRICKLAND, H. E. 1852. List of a collection of birds procured by C. T. Andersson in the Damara country of South-western Africa. *Jardine's Contribution to Ornithology* **1852**: 141-160.
- VILLALOBOS, C. & J. 1947. *Colour Atlas*. Buenos Aires.
- VINCENT, A. W. 1946. On the Breeding Habits of some South African Birds. *Ibis*, **1946**: 462-477.
- WALLIS, J. P. R. 1936. *Fortune my Foe; the story of C. J. Andersson, African explorer, 1837-1867*. 312 pp. London.

TABLES OF MEASUREMENTS

Abbreviations: B.M.—British Museum
 T.M.—Transvaal Museum
 S.A.M.—South African Museum
 M.C.—Meinertzhagen Collection
 F.P.—First Primary
 V.C.—B.M. Vellum Catalogue

C. a. albescens

Locality	Date	Alt.	Age	Sex	Wing	Tail	Bill	F.P.	Reference
Cape of Good Hope*	?	?	Ad.	?	90	64	17	33	B.M.
"	?	?	Ad.	?	88	63	19	31	B.M. 45:7:6:212
"	?	?	Ad.	?	89	63	19	27	B.M. V.C. 18:19a.
Cape Town	?	S.L.	Ad.	?	85	60	18	28	B.M. 70:12:31:750
Blaauwberg	21:6	S.L.	Ad.	♂	91	64	19	?	B.M. 1937:7:14:238
"	21:6	S.L.	Ad.	♀	88	62	19	33	B.M. 1937:7:14:237
Milnerton	?	S.L.	Ad.	♂	88	64	18	32	S.A.M. 13272
"	?	S.L.	Ad.	♂	93	67	20	32	T.M. 20765
"	?	S.L.	Ad.	♀	83	56	?	30	S.A.M. 13273
"	?	S.L.	Ad.	♀	82	57	18	28	S.A.M. 13273
"	?	S.L.	Ad.	♀	84	60	19	29	S.A.M. 13273
Durban Road	11:4	?	Ad.	♂	90	62	19	28	S.A.M. 14910
Philadelphia	10:4	?	Ad.	♂	94	68	20	30	S.A.M.
Berg River	?	?	Ad.	♀	88	61	20	27	B.M. 76:5:23:705
8 mls. NE. of Cape Town	26:4	?	Ad.	?	87	60	19	32	M.C.

* Type of *Alauda codea* Smith.

C. a. saldanhae

Locality	Date	Alt.	Age	Sex	Wing	Tail	Bill	F.P.	Reference
Saldanha Bay*	15:11	S.L.	Ad.	♂	91	62	19	?	T.M. 11881
"	10:10	S.L.	Ad.	♂	91	66	20	32	S.A.M. 7708
"	10:10	S.L.	Ad.	♂	91	68	19	31	S.A.M. 7809
Berg River	?	?	Ad.	?	90	64	20	29	B.M. 76:5:23:706
"	?	?	Ad.	?	93	66	20	30	B.M. 89:9:13:82
Lambert's Bay	29:10	?	Ad.	♂	92	71	19	?	T.M. 11878
Port Nolloth	19:8	S.L.	Ad.	♂	95	71	20	32	B.M. 1950:52:112
"	19:8	S.L.	Ad.	♂	95	72	22	?	T.M. 20901
"	19:8	S.L.	Ad.	♀	87	66	18	?	T.M. 20899
"	20:8	S.L.	Ad.	♀	85	64	19	?	T.M. 20902
25 mls. E. of P. Nolloth	20:8	500	Ad.	♀	86	61	20	?	T.M. 20903

C. a. guttata

Swellendam	?	?	Ad.	?	83	62	18	30	B.M. 74:4:5:656
Nels Poort	?	?	Ad.	?	92	64	17	26	B.M. 79:4:5:657
Traka	?	?	Ad.	?	91	68	?	34	B.M. 79:4:5:658
Deelfontein	23:2	?	Ad.	♂	94	69	?	28	B.M. 1903:3:9:470
"	28:2	?	Ad.	♀	84	62	16	26	B.M. 1903:3:9:471
"	28:1	?	Juv.	♂	92	66	15	29	B.M. 1901:9:5:23
"	7:3	?	Juv.	♀	?	?	?	?	B.M. 1901:9:5:26
Berg-Orange River†	?	?	Ad.	?	90	65	19	28	B.M. 1845:7:6:213
Klaver	28:9	?	Ad.	♂	92	66	18	?	T.M. 11874
"	28:9	?	Ad.	♂	93	67	18	33	S.A.M.
van Rhynsdorp	?	?	Ad.	♂	93	65	19	30	T.M. 15211
"	?	?	Ad.	♀	85	60	18	?	T.M. 15210
"	?	?	Ad.	♀	84	60	18	29	T.M. 15209
Calvinia†	?:8	?	Ad.	♂	99	72	19	?	T.M. 29012
"	?:8	?	Ad.	♀	89	64	17	?	T.M. 20913
"	30:4	?	Ad.	♂	93	71	18	35	M.C.
"	30:4	?	Ad.	♂	95	72	18	33	M.C.
"	30:4	?	Ad.	♂	90	67	18	33	M.C.
"	1:5	?	Ad.	♂	96	69	?	32	M.C.
"	1:5	?	Ad.	♂	90	66	18	32	M.C.
"	1:5	?	Ad.	♀	85	66	18	28	M.C.
"	30:4	?	Ad.	♀	89	65	17	26	M.C.
40 mls. E. of C.	2:5	?	Ad.	♂	90	64	18	29	M.C.
"	2:5	?	Ad.	♂	92	66	19	29	M.C.
"	2:5	?	Ad.	♂	94	71	18	31	M.C.
"	2:5	?	Ad.	♀	89	66	17	30	M.C.
Brandvlei	3:5	?	Ad.	♂	94	71	18	31	M.C.
Nr. Carnarvon	12:6	?	Ad.	♂	90	71	17	27	M.C.
Kamieskroon	25:9	2,500	Ad.	♂	94	68	?	32	S.A.M. 18231
"	28:9	2,500	Ad.	♂	96	71	?	32	S.A.M. 18233
"	30:9	2,500	Ad.	♂	92	65	19	36	S.A.M. 18232
"	2:12	2,500	Ad.	♂	88	63	17	32	B.M. 1950:50:940
"	2:12	2,500	Ad.	♂	93	68	18	33	B.M. 1950:50:939
"	4:12	2,500	Ad.	♂	91	65	19	28	B.M. 1950:50:934
"	3:12	2,500	Ad.	♀	86	60	17	27	B.M. 1950:50:942
"	3:12	2,500	Juv.	♀	86	64	18	32	B.M. 1950:50:941
Grootberg	29:7	?	Ad.	♂	93	67	18	36	B.M. 73:10:20:145
"	29:7	?	Ad.	♀	84	61	?	27	B.M. 73:10:20:232
Springbok	6:12	2,600	Ad.	♂	94	68	18	34	B.M. 1950:50:945
"	7:12	2,600	Ad.	♂	100	71	19	31	B.M. 1950:50:946
"	7:12	2,600	Juv.	♂	89	70	17	32	B.M. 1950:50:948
"	7:12	2,600	Juv.	♂	91	74	17	28	B.M. 1950:50:947
"	6:12	2,600	Ad.	♀	89	65	19	30	B.M. 1950:50:944
NW. of Springbok	8:5	?	Ad.	♂	86	70	19	?	M.C.
"	8:5	?	Ad.	♂	94	70	19	33	M.C.
"	8:5	?	Ad.	♂	100	74	20	31	M.C.

* Type of *Calendulanda albescens saldanhae* Roberts.† Co-type of *Alauda lagepa* Smith.‡ Type of *Calendulanda guttata calvinienensis* Roberts.

C. a. guttata (cont.)

Locality	Date	Alt.	Age	Sex	Wing	Tail	Bill	F.P.	Reference
NW. of Springbok	8:5	?	Ad.	♂	96	72	19	36	M.C.
"	8:5	?	Ad.	♀	90	65	18	33	M.C.
"	8:5	?	Ad.	♀	87	63	17	30	M.C.
Klipfontein	1:7	3,000	Ad.	♂	88	65	18	31	B.M. 1905:12:29:1437
"	17:8	3,000	Ad.	♂	91	68	17	?	T.M. 20904
"	22:12	3,000	Ad.	♂	92	?	18	29	B.M. 1950:50:952
"	9:4	3,000	Ad.	♀	85	63	17	28	B.M. 1905:12:29:1436
"	5:4	3,000	Ad.	♀	90	65	17	28	B.M. 1905:12:29:1435
"	10:7	3,000	Ad.	♀	87	64	18	30	B.M. 1905:12:29:1438
"	22:12	3,000	Ad.	♀	86	60	17	30	B.M. 1950:50:1000
Anemoos	1:4	600	Ad.	♂	90	67	?	33	B.M. 1905:12:29:1440
"	1:4	600	Ad.	♂	92	63	19	28	B.M. 1905:12:29:1439
25 mls. E of P. Nolloth	19:8	500	Ad.	♂	92	67	18	?	T.M. 20905
"	19:8	500	Ad.	♂	93	66	19	?	T.M. 20907
"	19:8	500	Ad.	♂	90	62	19	?	T.M. 20908
"	19:8	500	Ad.	♂	95	66	19	?	T.M. 20909
"	22:8	500	Ad.	♂	91	62	20	?	T.M. 20911
"	21:8	500	Ad.	♀	85	61	19	?	T.M. 20910
"	19:12	500	Ad.	♀	86	60	17	28	B.M. 1950:50:950
"	19:12	500	Ad.	♀	83	59	17	29	B.M. 1950:50:951
"	19:12	500	Ad.	♀	93	66	18	29	B.M. 1950:50:949
Port Nolloth	4:8	S.L.	Ad.	♂	89	63	19	30	B.M. 1905:12:29:1442
"	21:7	S.L.	Ad.	♀	86	58	20	30	B.M. 1905:6:20:10
"	18:7	S.L.	Ad.	♀	88	61	18	27	B.M. 1904:6:20:9

C. a. patae

Grey Phase									
38 mls. N. of P. Nolloth	19:12	S.L.	Ad.	♂	86	63	20	?	B.M. 1950:50:938
Grootderm	11:12	500	Ad.	♂	89	?	20	27	B.M. 1950:50:937
"	13:12	500	Ad.	♂	96	68	20	27	B.M. 1950:50:933
"	17:12	500	Ad.	♂	92	64	21	26	B.M. 1950:50:934
" *	17:12	500	Ad.	♂	89	67	21	?	B.M. 1950:50:936
"	13:12	500	Ad.	♀	84	61	18	26	B.M. 1950:50:932
"	17:12	500	Ad.	♀	86	62	17	27	B.M. 1950:50:935
Orange Mouth	24:9	S.L.	Ad.	♂	86	64	20	30	T.M. 25274
"	?:9	S.L.	Ad.	♀	87	64	19	?	T.M. 25275
"	?:9	S.L.	Ad.	♀	82	62	17	?	T.M. 25276
Red Phase									
Grootderm	13:12	500	Ad.	♂	86	63	21	30	B.M. 1950:50:929
"	17:12	500	Ad.	♂	89	67	20	29	B.M. 1950:50:930

C. a. cavei

Witputs	23:1	4,000	Ad.	♂	93	69	21	29	B.M. 1950:50:928
"	24:1	4,000	Ad.	♂	92	69	20	?	B.M. 1950:50:926
"	24:1	4,000	Ad.	♂	95	70	20	30	B.M. 1950:50:913
"	24:1	4,000	Ad.	♂	96	70	20	33	B.M. 1950:50:924
"	24:1	4,000	Ad.	♂	93	70	19	?	T.M. (C 205)
" †	26:1	4,000	Ad.	♂	96	71	21		B.M. 1950:50:922
"	25:1	4,000	Juv.	♂	89	65	20	26	B.M. 1950:50:916
"	25:1	4,000	Juv.	♂	91	72	20	19	B.M. 1950:50:918
"	23:1	4,000	Ad.	♀	85	64	18	?	B.M. 1950:50:925
"	23:1	4,000	Ad.	♀	83	59	18	28	B.M. 1950:50:923
"	25:1	4,000	Ad.	♀	87	64	18	26	B.M. 1950:50:912
"	26:1	4,000	Ad.	♀	85	62	18	?	B.M. 1950:50:915
"	26:1	4,000	Ad.	♀	84	64	17	?	B.M. 1950:50:920
"	26:1	4,000	Ad.	♀	86	64	18	29	B.M. 1950:50:921
"	27:1	4,000	Ad.	♀	85	63	18	27	B.M. 1950:50:927
"	24:1	4,000	Juv.	♀	78	65	17	30	B.M. 1950:50:914
"	25:1	4,000	Juv.	♀	84	64	17	27	B.M. 1950:50:919
"	26:1	4,000	Juv.	♀	82	61	17	28	B.M. 1950:50:917

* Type of *C. a. patae*.† Type of *C. a. cavei*.

C. a. barlowi

Locality	Date	Alt.	Age	Sex	Wing	Tail	Bill	F.P.	Reference
Aus (scrub)*	31:7	5,000	Ad.	♂	91	68	20	?	T.M. 20876
"	31:7	5,000	Ad.	♂	95	67	20	30	B.M. 1950:52:10
"	30:1	5,000	Ad.	♂	98	74	20	34	B.M. 1950:50:908
"	2:1	5,000	Ad.	♂	96	76	20	?	B.M. 1950:50:907
"	1:2	5,000	Ad.	♂	96	73	20	33	B.M. 1950:50:906
"	1:2	5,000	Ad.	♂	98	74	20	38	B.M. 1950:50:910
"	1:2	5,000	Ad.	♂	100	75	21	27	B.M. 1950:50:901
"	1:2	5,000	Ad.	♂	97	74	20	?	B.M. 1950:50:902
"	1:2	5,000	Ad.	♂	94	70	20	?	T.M. (M. 269)
"	1:2	5,000	Ad.	♂	97	73	19	?	B.M. 1950:50:905
"	2:2	5,000	Ad.	♂	93	70	19	29	B.M. 1950:50:911
"	31:7	5,000	Ad.	♂	96	72	21	?	T.M. 20881
"	31:7	5,000	Ad.	♂	95	71	19	?	T.M. 20879
"	31:7	5,000	Ad.	♂	94	72	20	?	T.M. 20880
"	30:1	5,000	Ad.	♀	90	66	19	29	B.M. 1950:50:909
"	1:2	5,000	Ad.	♀	86	66	18	?	B.M. 1950:50:900
"	1:2	5,000	Ad.	♀	89	68	18	32	B.M. 1950:50:904
"	1:2	5,000	Ad.	♀	92	71	18	?	B.M. 1950:50:903
"	31:7	5,000	Ad.	♀	88	63	18	?	T.M. 20878
"	31:7	5,000	Ad.	♀	86	64	18	?	T.M. 20883

C. a. erythrochlamys

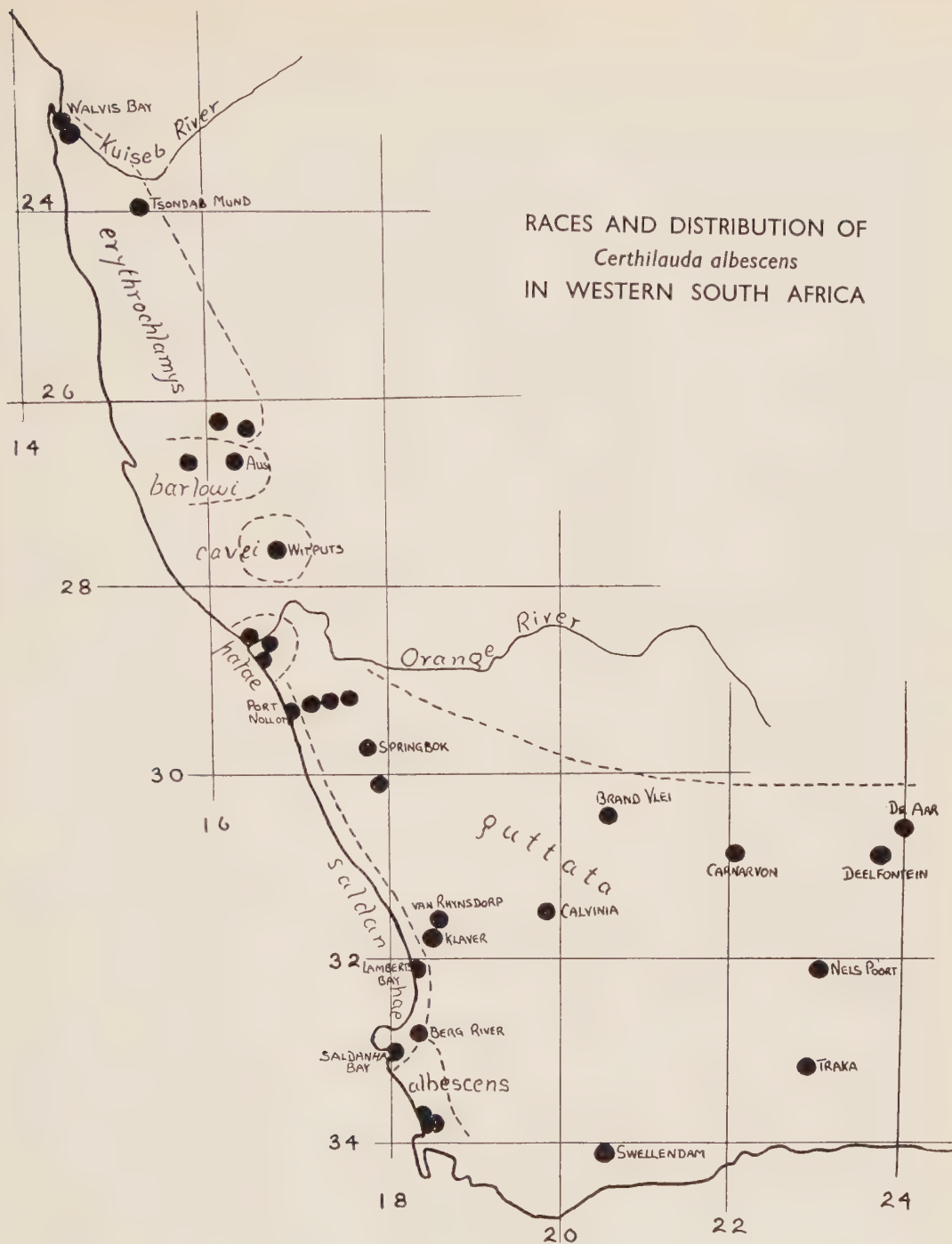
Kuiseb, nr. Walvis Bay	6:9	S.L.-600	Ad.	♂	93	68	20	?	T.M. 24914
"	6:9	S.L.-600	Ad.	♀	89	62	17	?	T.M. 24915
"	18:11	S.L.-600	Ad.	♂	91	67	19	27	B.M. 89:9:13:179
"	?	S.L.-600	Ad.	♂	90	68	19	27	B.M. 73:18:20:218
"	?	S.L.-600	Ad.	?	89	67	19	28	B.M. 76:5:23:710
"	18:12	S.L.-600	Ad.	♂	92	67	21	?	T.M. 15104
"	20:11	S.L.-600	Ad.	?	89	68	17	30	B.M. 76:5:23:709
"	26:5	S.L.-600	Juv.	♂	87	68	18	29	B.M. 76:5:23:708
"	?	S.L.-600	Juv.	?	90	68	17	29	B.M. 66:7:19:2
Tsondab Mund	5:3	2,700	Ad.	♂	98	69	20	31	B.M. 1950:50:898
"	5:3	2,700	Ad.	♂	93	66	20	28	B.M. 1950:50:882
"	5:3	2,700	Ad.	♂	88	62	19	25	B.M. 1950:50:886
"	6:3	2,700	Ad.	♂	89	67	20	33	B.M. 1950:50:893
"	6:3	2,700	Ad.	♂	92	63	20	26	B.M. 1950:50:890
"	6:3	2,700	Ad.	♂	96	70	19	34	B.M. 1950:50:891
"	6:3	2,700	Ad.	♂	90	63	20	27	B.M. 1950:50:883
"	6:3	2,700	Ad.	♂	90	64	20	27	B.M. 1950:50:894
"	6:3	2,700	Ad.	♂	95	67	21	30	B.M. 1950:50:899
"	6:3	2,700	Ad.	♂	92	66	20	20	B.M. 1950:50:896
"	6:3	2,700	Ad.	♂	92	67	20	28	B.M. 1950:50:889
"	6:3	2,700	Ad.	♀	88	63	18	30	B.M. 1950:50:897
"	6:3	2,700	Ad.	♀	86	62	18	27	B.M. 1950:50:888
"	6:3	2,700	Ad.	♀	87	62	18	28	B.M. 1950:50:885
"	6:3	2,700	Ad.	♀	86	61	18	28	B.M. 1950:50:895
"	6:3	2,700	Ad.	♀	83	60	18	25	B.M. 1950:50:892
"	6:3	2,700	Ad.	♀	87	66	18	31	B.M. 1950:50:887
"	6:3	2,700	Juv.	♀	82	60	16	24	B.M. 1950:50:884
Aus (dunes)	31:1	2,900	Ad.	♂	95	?	20	32	B.M. 1950:50:881
"	31:1	2,900	Ad.	♂	97	70	20	28	B.M. 1950:50:877
"	30:7	2,900	Ad.	♂	96	69	20	?	T.M. 20888
"	29:7	2,900	Ad.	♂	91	69	19	?	T.M. 20885
"	30:7	2,900	Ad.	♂	93	70	18	?	T.M. (R 598)
"	30:7	2,900	Ad.	♂	93	71	20	?	T.M. 20893
"	30:7	2,900	Ad.	♂	91	70	20	?	T.M. 20889

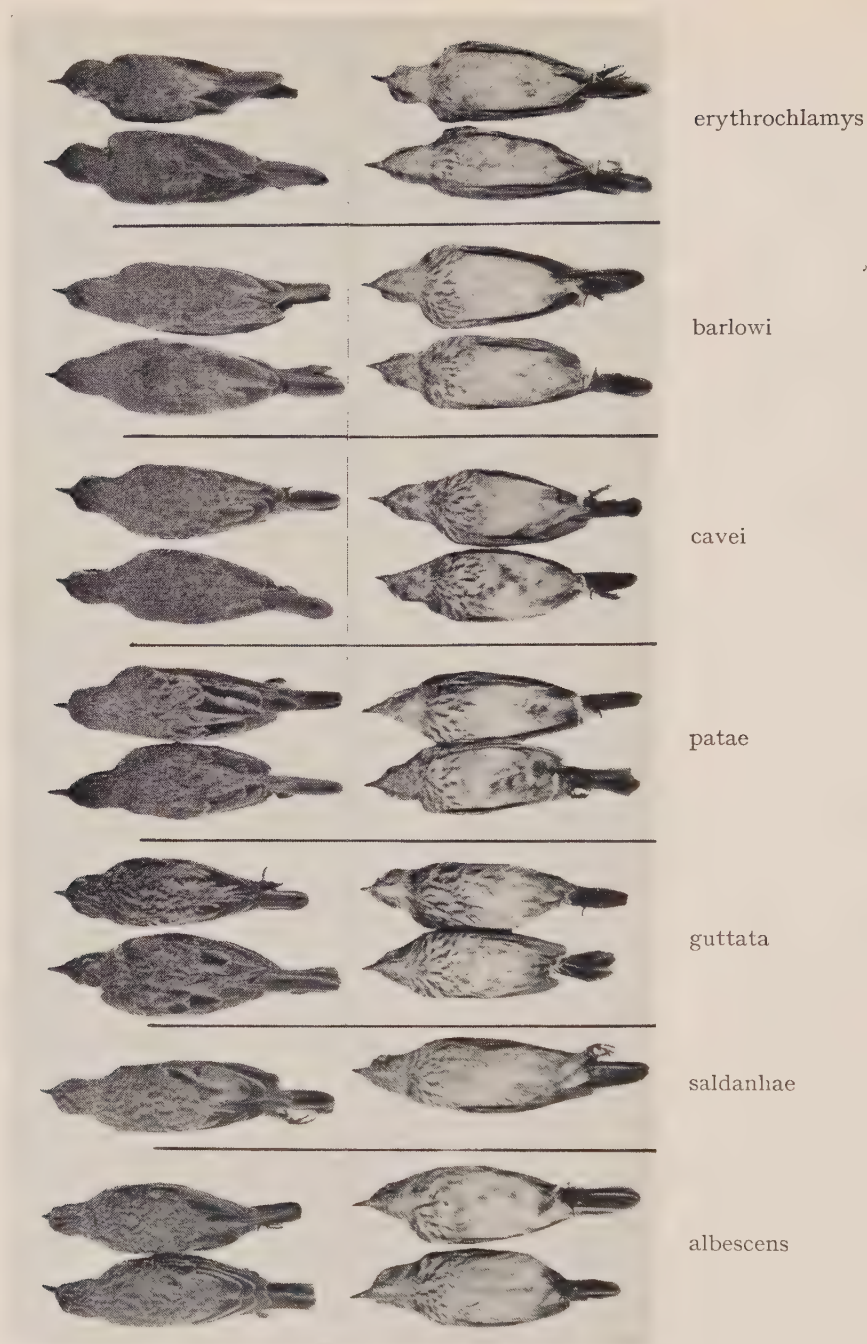
* Type of *Pseudammomanes barlowi* Roberts.

C. a. erythrochlamys (cont.)

<i>Locality</i>	<i>Date</i>	<i>Alt.</i>	<i>Age</i>	<i>Sex</i>	<i>Wing</i>	<i>Tail</i>	<i>Bill</i>	<i>F.P.</i>	<i>Reference</i>
Aus (dunes)	30:7	2,900	Ad.	♂	91	69	19	?	T.M. 20890
"	31:1	2,900	Ad.	♀	88	?	17	29	B.M. 1950:50:878
"	31:1	2,900	Ad.	♀	90	69	17	27	B.M. 1950:50:876
"	31:1	2,900	Ad.	♀	89	70	20	25	B.M. 1950:50:879
"	31:1	2,900	Ad.	♀	85	60	19	24	B.M. 1950:50:880
"	30:7	2,900	Ad.	♀	85	66	16	?	T.M. 20896
"	30:7	2,900	Ad.	♀	85	67	17	?	T.M. 20895
"	30:7	2,900	Ad.	♀	86	65	18	?	T.M. 20894
"	30:7	2,900	Ad.	♀	87	68	18	?	T.M. 20892
"	30:7	2,900	Ad.	♀	83	64	18	?	T.M. 20887

RACES AND DISTRIBUTION OF
Certhilauda albescens
IN WESTERN SOUTH AFRICA





VARIATION IN *CERTHILAUDA ALBESCENS*

For distribution of races see map. Changes in pattern are fairly evident and some changes in colour tone can be distinguished



(a) Typical desert-edge country about five miles south of Witputs, Huns Mts., with sparse low scrub and prostrate succulents. Red-back Larks (*Certhilauda albescens cavei*) were present in twos; spike-heel Larks (*Certhilauda albofasciata*) in parties of three to five; and Red-cap Larks (*Tephrocorys cinerea*) in restless flocks



(b) Shifting sand dunes in the Namib Desert at Tsondab Mund, showing clumps of spiky *Aristida* grass frequented by Red-back Larks (*Certhilauda albescens erythrochlamys*)

PRINTED IN
GREAT BRITAIN
AT THE
UNIVERSITY PRESS
OXFORD
BY
CHARLES BATEY
PRINTER
TO THE
UNIVERSITY